

MODEL EMERGENCY ACTION PLAN

MONITORING AND EMERGENCY WARNING

PLAN AND PROCEDURES

for

(NAME OF DAM)

Owned by:

ISSUE DATE:

REVISED DATE:

DAM NAME

Signatures of Persons Involved in Emergency Action Plan

Dam Owner

By _____ Date _____

Typed Name:

Title:

Phone:

**County Department of
Emergency Operations**

By _____ Date _____

Typed Name:

Title:

Phone:

**Maryland State Police
Barracks "B"**

By _____ Date _____

Typed Name: _____

Title

Phone:

Local Fire Department

By _____ Date _____

Typed Name:

Title:

Phone:

**MD Department of the Environment
Dam Safety Division**

By _____ Date _____

Typed Name: Brad Iarossi

Title: Chief

Phone: 410-631-3538

Owner's Engineer*

By _____ Date _____

Typed Name:

Title: _____ PE#

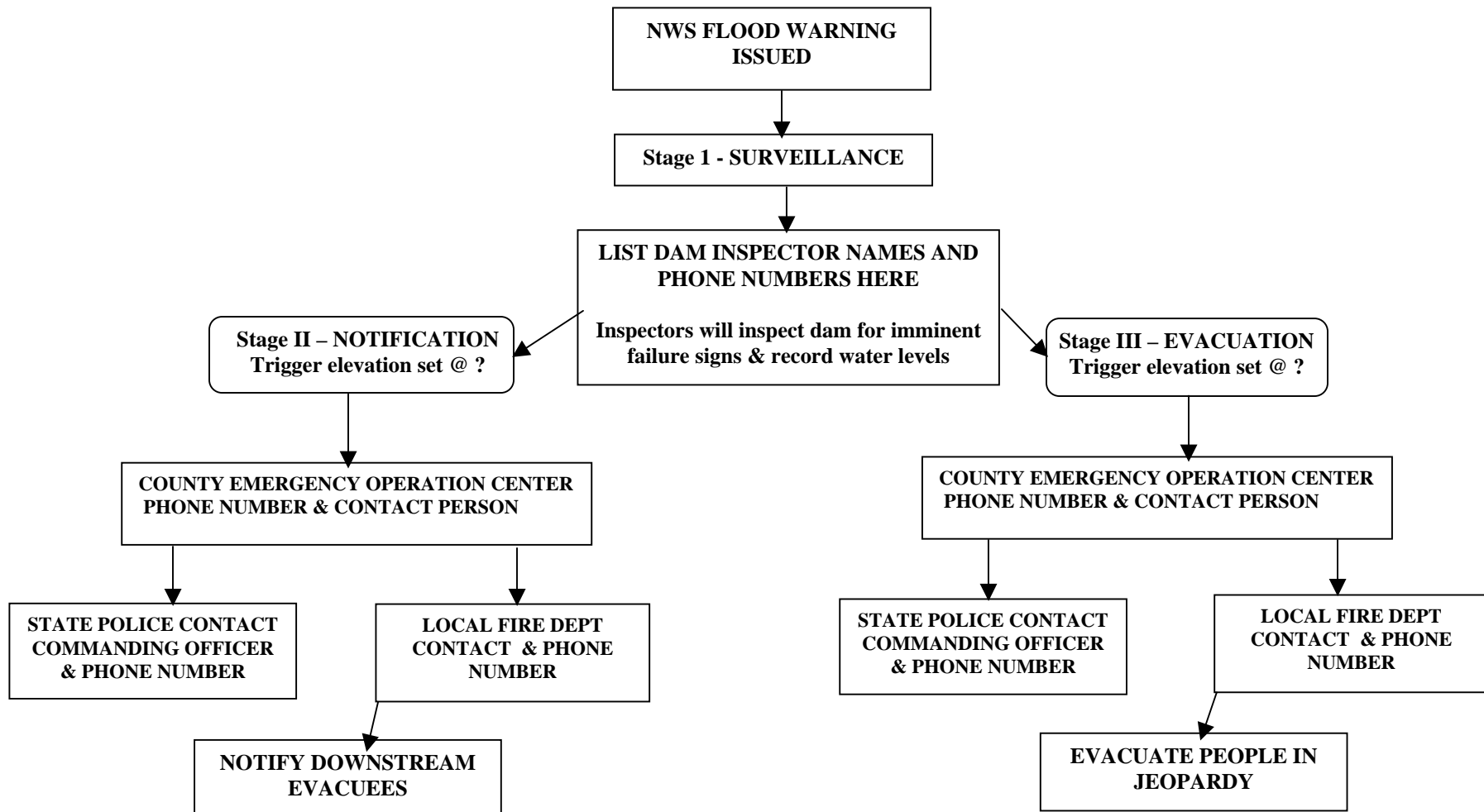
Phone:

*The owner's engineer is designated to provide engineering experience and recommendations to continue or terminate the emergency condition at the dam. The engineer's recommendations are based on inspections of the dam during signs of distress, flows in the emergency spillway, overtopping of the dam, or emergency actions after an evacuation.

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NOTIFICATION FLOW CHART



A notification flow chart is to be developed similar to the example shown above. The notification flow chart is a schematic representation of the hierarchy for notification during an emergency situation, including who is to be notified, by whom, and in what priority. Include contact names and alternates and day & night telephone numbers. Reservoir trigger elevations to notify and warn downstream evacuees are included on the flow chart. When developing the notification flow chart, the following items should be considered: 1) travel time of the flood wave; 2) time to evacuate; 3) impassable roads; and 4) other considerations that establish a priority sequence in the notification.

Introduction

- 1) **Purpose.** The purpose of the Emergency Action Plan (EAP) is to safeguard lives and secondarily to reduce property damage in the event that (your dam) would fail. To carry out this mission, the EAP contains: 1) procedures to monitor (your dam) during storm events; 2) notify local authorities of a potential dam failure; and 3) warn and evacuate the population at risk. These procedures are to supplement and be used in conjunction with (your County's Emergency Operation Plan).
- 2) **Flood Description.** Failure of the dam could cause significant damage to the communities of (your downstream communities), located ___ miles downstream of (your dam). There are single-family dwellings, and commercial and industrial buildings located within the danger reach below the dam that are vulnerable to flooding. In addition, a dam failure could overtop and damage (all roads downstream of your dam within the danger reach that are overtopped).
- 3) **General Information.** Your dam was completed in (year) for the purpose of water supply, flood control, stormwater management control, and recreation. The dam is owned and maintained by dam owner and is located on (name of stream) approximately ___ miles (upstream or downstream) of (closest road). The earth fill dam is ___ feet high, ___ feet wide at top, and ___ feet long from abutment to abutment. The dam has a (size and type of spillway) principal spillway. A grass emergency spillway located in the left/right abutment ___ feet wide carries flood discharges above the ___ - year storm.
- 4) **Periodic Inspection.** Periodic inspections of the dam will be performed by the dam owner or the owner's inspector. Inspections will be conducted to determine the condition of the embankment, spillways, reservoir area, outlet channel and riser.
- 5) **Notification Flow Chart.** A notification flow chart shall be developed and placed at the front of this EAP for quick reference in the event of an emergency. The flow chart shall include the names and phone numbers of all agencies involved as well as the order of notification.
- 6) **Plan Review.** The plan shall be reviewed annually by the dam owner to assure that telephone numbers and contact persons are current and to include any additional residences or businesses that are built within the danger reach zone.
- 7) **Plan Stages.** The plan consists of three stages of operation, surveillance, notification, and evacuation. Surveillance is activated by the issuance of a "Flood Warning" by the National Weather Service (NWS). Predetermined trigger elevations shall be established to activate notification and evacuation and is based on the hydrologic routing model to give enough lead-time to provide a stand-by alert and evacuation. For small dams, one-hour lead-time for notification and 2-hour lead-time for evacuation is normally sufficient prior to significant downstream flooding.

Surveillance During Normal Conditions

The dam inspector or owner will conduct an on-site visual inspection of the dam once every three months.

- 1) The inspection includes visual examination of: 1) upstream & downstream faces of dam for slope failures, cracks, settlement, or seepage; 2) spillways for clogging, cracking, or leaking; 3) internal drains and seeps for clogging, turbidity, muddy water, or increased flow; and 4) reservoir and downstream areas for landslides. A detailed inspection checklist and guidelines are located in the Maryland Dam Safety Manual
- 2) Any abnormal conditions found during the normal inspection will be brought to the attention of the owner's engineer and the Maryland Dam Safety Division.

Imminent Failure Signs of Dam

The dam owner and his designated representative are responsible for determining the dam's failure potential. The following conditions may constitute a dam emergency:

- 1) The reservoir level is at or near the top of the dam & water is flowing over or about to flow over top of the dam.
- 2) The overflow pipe or spillway is clogged with debris or ice, which is causing a rapid rise in the lake level.
- 3) The emergency spillway is experiencing heavy flow that is causing severe erosion to the spillway or dam embankment.
- 4) The upstream or downstream embankment slopes are sliding or collapsing and impeding the spillway flow.
- 5) Large sinkholes or cracks are found on the dam embankment.
- 6) Heavy seepage is observed on the downstream embankment slope or toe that is washing the embankment soils downstream.

Stage I - Surveillance During Storm Conditions

The (local *emergency operation center*) shall notify the dam inspector when the National Weather Service issues a "Flood Warning" for the area. The dam inspector will monitor the facility during the "Flood Warning".

- 1) The inspector will note and record water elevations at the beginning of the storm. In addition to the water elevations, the inspector shall note the rate the reservoir is increasing, debris accumulation in the spillways and seepage on the downstream slope of the dam. The water levels shall be monitored continuously and recorded at least once every hour. If warranted, the drain gates or operating floodgates shall be slowly opened to lower the reservoir pool for additional flood storage.
- 2) The inspector will test the primary (telephone) and secondary (two-way radio) communications at this time. When the reservoir elevation reaches a predetermined trigger elevation, the (local *emergency operation center*) shall be notified and Stage II (Notification) shall be activated.
- 3) If at any time the dam embankment is collapsing or eroding due to internal seepage flows, or if the dam shows signs of imminent failure, immediately proceed to Stage III (Evacuation).

Stage II - Notification

When the water level in the reservoir reaches the Stage II trigger elevation, the dam inspector shall notify the (local *emergency operation center*) to activate the notification stage.

- 1) The water levels will be monitored on a continuous basis and recorded at least every 15 minutes.
- 2) The (local *emergency operation center*) will activate the notification and communication network, which includes notifying the local and state police and the local fire departments.
- 3) The (local and state *police*) shall barricade any roads and bridges that are being flooded to safeguard traffic in flooded areas.
- 4) The (local *police and fire departments*) shall notify the population at risk to prepare for a possible evacuation.
- 5) If at any time the dam embankment is collapsing or eroding due to internal seepage flows, or if the dam shows signs of imminent failure, immediately proceed to Stage III (Evacuation).

Stage III - Evacuation

Evacuation shall occur any time if the Stage III trigger elevation is reached, if the dam embankment is collapsing or eroding, or if failure is imminent.

- 1) The dam inspector shall notify the (*local emergency operation center*) to evacuate the downstream population at risk.
- 2) Water levels will be monitored on a continuous basis and recorded at least every 15 minutes and transmitted to the (*local emergency operation center*).
- 3) The dam inspector will conduct visual inspections of the dam for embankment seepage and erosion, and spillway seepage and blockage, and provide preventative measures as listed on page 10. Preventative measures include lowering the reservoir pool, providing sand bags for additional freeboard capacity, and placing riprap in eroded areas.
- 4) Evacuees shall be transported to shelters such as local schools and attended to by the American Red Cross as directed by the Emergency Management Agency.

Termination of Emergency at the Dam

The emergency at the dam may be terminated when the reservoir level has dropped to Elevation _____ and there are no signs of distress to the dam and no additional rainfall is predicted. It is recommended that owner's engineer be contacted for advice in terminating the emergency at the dam.

The local Emergency Management Official shall be contacted when the emergency at the dam is terminated. Authorization for residents to return to their homes in the evacuation area shall come from the Emergency Management Official in charge and not the dam owner.

Evacuation List

(Ranked in order of residences or businesses first affected by flood waters)

Name	Address	Phone
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		

This list must include at a minimum the street addresses of the homes and businesses within the danger reach. For a danger reach with a small number of affected people, names and phone numbers should be included in the evacuation list.

PREVENTATIVE ACTIONS

If time allows, contact your engineer (_____) and the Maryland Dam Safety Division for advice on preventative actions. Listed below are potential emergency actions which may prevent or delay the failure of the dam. They should be considered based on site-specific conditions, as well as the risk of failure and risk to employees.

Possible Actions To Be Taken In The Event Of:

Imminent Overtopping by Flood Waters:

- 1) Open drain or flood gates to maximum capacity.
- 2) Place sand bags along the dam crest to increase freeboard.
- 3) Place riprap or sandbags in damaged areas of dam.
- 4) Provide erosion protection on downstream slope by placing riprap or other appropriate materials.
- 5) Divert flood waters around dam if possible (such as emergency spillway)

Erosion of Dam by Seepage Through the Embankment, Foundation, or Abutments:

- 1) Plug the seepage with appropriate material such as (riprap, hay bales, bentonite, sandbags, soil, or plastic sheeting if the leak is on upstream face of dam).
- 2) Lower the reservoir level until the flow decreases to a non-erosive velocity or stops leaking.
- 3) Place a sand and gravel filter over the seepage exit area to minimize loss of embankment soils.
- 4) Continue lowering the reservoir level until the seepage stops or is controlled. Refill reservoir to normal levels only after seepage is repaired.

Slide or Slope Failure on Upstream or Downstream Slope of Embankment:

- 1) Lower the reservoir water level at a rate, and to an elevation that is considered safe. Contact your engineer or the Dam Safety Division to determine a safe level. If the spillway outfall is damaged or blocked, pumping, siphoning, or a controlled breach may be required.
- 2) Restore lost freeboard by placing sandbags or filling in the top of the slide.
- 3) Stabilize slide by weighting the toe area with additional soil, rock, or gravel.

Failure of Spillway Structure or Outlet:

- 1) Lower the water level to a safe elevation. If the reservoir drain is inoperable, pumping, siphoning, or excavating an emergency spillway or controlled breach may be required.
- 2) Implement temporary measures to protect the damaged structure.
- 3) If necessary, employ experienced, professional divers, to assess the problem and possibly implement repair.

SUPPLIES AND RESOURCES

In an emergency situation, equipment and supplies may be needed on short notice. The following supplies and resources may be needed during an emergency: earthmoving equipment, sand and gravel, sandbags, riprap, pumps, pipe, laborers.

List of Contractors

It will be the responsibility of the owner to maintain the list of contractors that may be contacted during an emergency condition for equipment, materials, and repairs.

For each contractor on the list, the following information is needed:

- Contractor name
- Contact person.
- Address.
- Phone number.
- Scope of its contracted services.

1. Contractor:

Contact person: _____ Phone No:

Address:

Services contracted for: _____

2. Contractor:

Contact person: _____ Phone No:

Address:

Services contracted for:

3. Contractor:

Contact person: _____ Phone No:

Address:

Services contracted for: _____

COMMENTS ON THE DANGER REACH INUNDATION MAPS

The danger reach maps should be large enough to show all structures that will be flooded during a dam failure but small enough to be included in the EAP document. We suggest keeping the map panels no larger than 11" X 17".

The danger reach maps should show the flood inundation areas for a normal pool and design storm failure with evacuation routes clearly marked. When preparing the evacuation routes, it is important to identify roads that may become impassable in advance of the evacuation notice. County roads will usually flood somewhere between a 2 and 100-year frequency storm event prior to a dam failure. It is recommended that your engineer determine what storm events will overtop downstream roads, or review existing 100-year floodplain maps or other flood studies to identify evacuation routes.

This page or pages will contain the danger reach inundation maps

EMERGENCY ACTION PLAN FOR _____ DAM

UPDATE, EXERCISE AND TRAINING

The Emergency Action Plan for the _____ dam was updated on _____(date), a _____ (type: Tabletop, Functional) exercise was performed on _____(date) and staff training on the implementation of this EAP was provided on _____(date).

Any needed modifications as a result of the update, or training exercise are attached and revisions have been provided to other role players with responsibilities listed in the EAP.

OWNER: _____

DATE: _____

* This form is to be submitted to the Dam Safety Division by July 1st of every year following the approval of the plan.